

INASA

Illinois Mathematics and Science Academy





DEAR IMSA ST

The mission of the Illinois Mathematics and Science Academy, a pioneering educational community, is to transform mathematics and science teaching and learning by developing ethical leaders who know the joy of discovering and forging connections within and among mathematics, science, the arts, and the humanities by means of an exemplary laboratory environment characterized by research, innovative teaching, and service.

We are pleased to share with you the 1997-98 annual report of the Illinois Mathematics and Science Academy. In this, we report some highlights of IMSA's 12th year, including highlights of our residential educational program for IMSA students and our statewide service programs for Illinois teachers, other students, schools and policymakers.

In 1997-98 we began implementing IMSA's visionary Second Decade Growth Plan which the Board endorsed in the Spring of 1997. The Growth Plan was designed to strengthen our capacity to: realize our mission, achieve our

AREHOLDERS

objectives and fulfill our legislative charge; connect, integrate and leverage teaching and learning, research and service work more effectively; attract and secure additional resources for strategic priorities; and ensure IMSA's viability and sustainability in a rapidly changing and increasingly competitive environment.

As we look to the future, our vision for leadership in teaching and learning is to be an exemplar of a new learning paradigm that:

- *ignites students' capacity for creative investigation and discovery and significantly influences life on our planet*
- *reshapes how learning is defined, assessed and certified*
- *invites personalized and collaborative learning through access to resources any time, any place, any pace*
- *develops courageous, inspired and ethical leaders who enter a covenant with the world to make it a better place.*

Our vision for leadership in professional practice and policy is to be an exemplar of a new teaching paradigm that:

- *builds the intellectual (knowledge and skills) and creative power and imagination of all educators to liberate the goodness and genius of children*
- *liberates the power, imagination and creativity within Illinois to become a sustainable community of learners in mathematics and science.*

We will need your support, and the support of many others, to achieve this vision. It is big—vision should be big—but we believe it can be achieved. We look forward to our partnership with you in this important and worthy endeavor.

Sincerely,



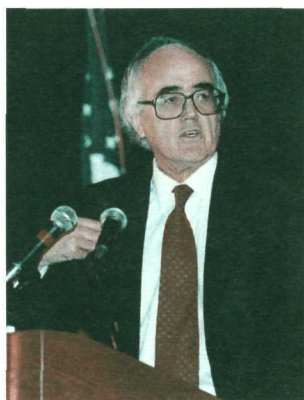
John H. McEachern Jr.
Chairman



Stephanie Pace Marshall, Ph.D.
President



YEAR AT A GL



Best selling author, award-winning writer-producer and science historian James Burke presented the Seventh Annual James R. Thompson Leadership Lecture at IMSA November 21, 1997. More than 1,400 people filled the gymnasium to hear his presentation.

Academic Programs

Expanded Student Research and Inquiry programs for students to pursue compelling questions of interest, conduct original research, create products, present and publish, and collaborate with other students, mentors, scholars, researchers and inventors

140 students in IMSA's Mentorship Program, working on-site with scientists and scholars in corporations, educational institutions and laboratories in the Chicagoland area

Student Achievements

Fifth place in the prestigious Westinghouse Science Talent Search competition

Presentations at the American Association for the Advancement of Science and the Student Research Symposium of the National Consortium for Specialized Secondary Schools of Mathematics, Science and Technology

59 National Merit semifinalists, six National Achievement semifinalists

Numerous awards in academic competitions including the national Mandelbrot Competition, Illinois History Exposition, National Knowledge Master Open, North Suburban Math League, American High School Math Exam, National Russian Essay Contest, Illinois Scholastic Bowl, United States Mathematical Olympiad and the Illinois Future Problem-Solving Bowl

Statewide Service

Opening of the Center for Collaborative Inquiry in Mathematics and Science (CCIMS) to serve Illinois educators and students. (NOTE: In 1998-99 CCIMS and the Center for Problem Based Learning merged into one professional development Center at IMSA.)

Hosting of the Annual Conference for the National Association of Science, Technology and Society

Publication of the book Problems as Possibilities: Problem-Based Learning for K-12 Education, authored by IMSA staff, and production of a PBL video, Problem-Based Learning: 3 Classrooms in Action

Inaugural Science Explorers Program, for elementary students, taught by IMSA students and area scientists including IMSA alumni

Special Events

Seventh annual James R. Thompson Leadership Lecture, featuring James Burke, best selling author, award-winning writer-producer and renowned science historian

Dedication of the James R. Pearson Hall (founding board chairman) and the Bell & Howell and UMI Research area (major corporate donor) in IMSA's Leto M. Furnas Information Resource Center

Second Decade Growth Plan

In 1997-98 IMSA began implementing its Second Decade Growth Plan endorsed by the Board of Trustees in the Spring of 1997. The Growth Plan was built around three Program Challenges and four Program Support Challenges, each of which includes strategies which in turn include specific action plans.

Program Challenges

- 1 To increase IMSA's capacity to help IMSA students become integrative learners and ethical leaders with a deep understanding of themselves, their world and their place in it.
Includes strategies for student research and inquiry, program personalization, ethical leadership development, assessment of student learning, student information system, and talent identification within the context of racial, cultural and gender equity.
- 2 To lead the transformation of teaching and learning in mathematics and science in Illinois and beyond.
Includes strategies related to statewide public policy initiatives, collaborations with Illinois State Board of Education, the Illinois Board of Higher Education and the 1st in the World Consortium, leadership of The Center @ IMSA, institutional and program research, and "learning at a distance" initiatives.
- 3 To build the capacity of Illinois educators (including IMSA educators) to transform mathematics and science teaching and learning in their settings.
Includes strategies related to products and services for Illinois teachers and students, publishing IMSA's work, professional development programs, and networks of educational partners, associates and fellows.

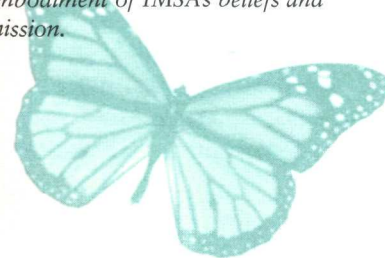
Program Support Challenges

To explicitly integrate the work and interests of staff, students and parents into the work of IMSA the learning enterprise and specifically the work of the Centers.

To sustain an exemplary computing and information technology environment that provides desktop computing services, server or shared resource computing resources, network services, data services and customer services to advance IMSA's mission.

To build and sustain strong commitment to and support for IMSA's mission by identified constituent groups.

To sustain an innovative and flexible learning and service environment that assures the best use of resources, compliance with state and federal regulations, and an understanding and embodiment of IMSA's beliefs and mission.



Sixth annual Richard L. Horwitz Lecture on Ethics, featuring former Illinois Comptroller Dawn Clark Netsch

Commencement of the 201-member Class of 1998, featuring Commencement speaker Stanford University Professor Dr. Stephen Schneider, a senior fellow at the Institute for International Studies and expert on climate and environmental issues, and student speakers Adrian Wong of Homewood and Nalo Jackson of Rock Island

Leadership Investments

\$13.15 million in operating funds by the State of Illinois to support IMSA's residential/academic program and statewide service programs

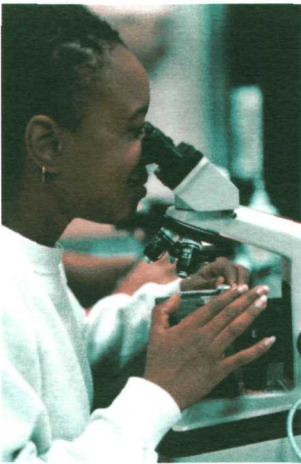
A record \$2.3 million in gifts by corporations, foundations and individuals to the IMSA Fund for Advancement of Education to support various initiatives

\$750,000 from The Grainger Foundation of Skokie to create the Grainger Center for Imagination and Inquiry and quadruple the space for student research

\$500,000 from a young IMSA graduate to establish a permanent endowment to support research opportunities for IMSA students and professional development initiatives for Illinois teachers

\$ 100,000 from The Tellabs Foundation of Lisle to create the Tellabs Studio for Professional Development

To increase IMSA's capacity to help IMSA students become integrative learners and ethical leaders with a deep understanding of themselves, their world and their place in it.



Opportunities for IMSA students to do real-world "hands on" research have been available at the Academy since 1988 through the IMSA Mentorship Program. This learning opportunity provided to IMSA students has grown from 24 students in 1989 to more than 140 in 1997-98.

Second Decade PROGRAM

Supporting this new challenge for the next decade is the IMSA Student Research and Inquiry Program. Launched during the 1997-98 year, this systemic program supports the development of students as highly skilled and integrative problem finders, problem solvers and apprentice investigators.

In 1997-98, all IMSA sophomores, juniors and seniors were invited to participate in the IMSA Student Research and Inquiry Program. The program is value-added to the overall IMSA learning experience because it provides unique opportunities for students to pursue compelling questions of interest, conduct original research in science and other fields, create and invent products and services, share their work through presentations and publications, and collaborate with other students, mentors, scholars, researchers and inventors throughout the world.

Research and inquiry opportunities are provided for students in a variety of ways including courses, a mentor-

ship program and independent study projects. By definition, Inquiry should pose and answer a specific question or problem and is carried out under the guidance of an experienced teacher in the field. To help evaluate the merits of proposed Student Inquiry projects, the Student Inquiry Review Council (SIRC) also was established in 1997-98 to review, make recommendations and approve all proposed Student Inquiry projects.

The following are examples of different types of Student Research and Inquiry Projects conducted during the 1997-98 year. Many of these projects received state, national and international recognition for the quality of the research. For example, a group of IMSA students were invited to make poster and oral presentations at the 1998 American Association for the Advancement of Science (AAAS) Annual Meeting and Science Innovation Exposition Feb. 12-18 in Philadelphia, Pennsylvania.



Several students in IMSA's Ecology class practiced using radio telemetry equipment (shown here), a method used to establish the territorial movement of wolves and coyotes.

CHALLENGE 1

IMSA Student Research Presentation Profile

American Association for the Advancement of Science (AAAS)
Annual Meeting and Science Innovation Exposition

February 12–18, 1998
Philadelphia, Pennsylvania

IMSA Student Research Topics:

- *Anticarcinogenic Effects of Soybean Extract*
- *Blood Clotting Characteristics of Synthetic Anticoagulants*
- *Changes in the Morphology of Hydra after Treatment with ATP*
- *Changes in Growth Factors Produced in Bone Marrow as a Result of Aging*
- *Immune System Regulation by Cytokines*
- *Ovarian Autoimmunity and Infertility*
- *Analysis of Charge Conjugation Symmetry in Particle Physics*

National Consortium for Specialized Secondary Schools of Mathematics, Science and Technology
Fifth Annual Student Research Symposium

June 4–7, 1998
Bloomington, Illinois

IMSA Student Research Topics:

- *The Effects of Androgen on Nitric Oxide Synthase Expression in Adult Rat Brains*
- *Controlling a Microelectromechanical Clamp Using the Basic Stamp II Microcontroller*
- *Complement Inhibitors - Use in Xenotransplantation*

Other Student Research Highlights

IMSA senior Travis Schedler of Carbondale captured 5th place and a \$15,000 scholarship in the nationwide 57th Westinghouse Science Talent Search Competition. Schedler was one of 40 national finalists and was the only finalist from Illinois. His award-winning research project, *Construction and Properties of Set-theoretical Solutions to the Quantum Yang-Baxter Equation*, involved quantum group theory, a subject at the interface of mathematics and physics.

IMSA senior Kuntal Shah of Burr Ridge received the Student Intern Award from the Elizabeth Glaser Pediatric AIDS Foundation. His research focused on understanding the molecular evolution of the HIV-1 Vpr protein.

For abstracts of 1997–98 Student Research and Inquiry Projects, contact the Office of Institutional Advancement at (630) 907-5040.

(Challenge 1 continued on pg. 6)



1998 Graduates Andrew Torres of Tinley Park, Jennifer Ohlson of Chicago and Katja Meyer of Maple Park celebrate their special day.

Grainger Center for Imagination and Inquiry to Quadruple Space for Student Research

Supporting students in their research pursuits will be the construction of the Grainger Center for Imagination and Inquiry. The Center will more than quadruple the current space for student research and inquiry at IMSA thanks to a \$750,000 gift received during the 1997-98 year from The Grainger Foundation of Skokie, Illinois.

The expansion of current research space will enable more students to participate in cutting edge research and also would increase the variety of research opportunities available. "Tinkering" activities for the 21st Century learner will range from research in spectroscopic studies to biological research relating to DNA and protein electrophoresis.

Renovation of the 3,336 square ft. space will include creating multi-functional mobile and fixed workspace for independent and collaborative research, increasing storage space for student research works "in progress", providing specialized hardware and software for research and experiments that require high level recording of complex data, creating a library space for technical manuals and research/ethics books and creating seminar space where students can have video

conferences with off-site mentors and conduct multimedia presentations.

Examples of Research Projects that the Grainger Center for Imagination and Inquiry Could Support:

- *Student electronic research projects for the control of robotic devices or logic boards for the control of circuits*
- *Opportunities for design and research in spectroscopic studies*
- *Holographic studies of materials for imaging and stress*
- *Computer software and network research about computers such as issues of distributed computing or neural network programming*
- *The study of biological research relating to DNA and protein electrophoresis, developmental and behavioral genetics*
- *Investigations into predator-prey and/or competition relationships, diversity, and soil community interactions.*

Longitudinal Study of IMSA Graduates

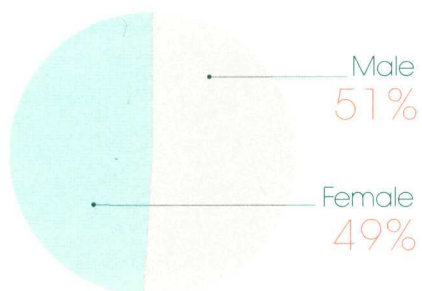
To determine the impact of the overall IMSA experience on students' development, obtain valuable recommendations for program improvement, and track how graduates contribute to the betterment of Illinois, the nation and world, the Academy conducts the Longitudinal Study of IMSA Graduates.

In the past, surveys were conducted during an IMSA graduates' freshman and senior year in college. In 1998, the research study was redesigned to include a post-college survey, seven years after a class had graduated from IMSA. The one year and four year-post IMSA graduation studies includes a comparison group of other academically talented students from Illinois who did not attend IMSA. The seven year-post IMSA graduation study includes a comparison group of graduates of Illinois state universities who have been out of high school for nine years.

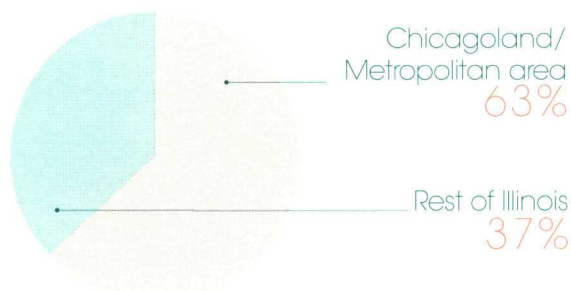
Some of the results from the Class of 1991 survey included the following:

- *83.9% of IMSA graduates completed a Bachelor's Degree; 12.9% completed a Master's Degree*
- *45.2% of IMSA graduates were currently working on a higher degree*
- *Of IMSA graduates who had pursued or earned a degree beyond a Bachelor's Degree, they had stated that IMSA had helped develop study skills and habits of mind such as critical thinking and conceptual thinking. Students also responded that they felt especially well prepared for academic rigor, particularly in math and science*

Gender



Geography

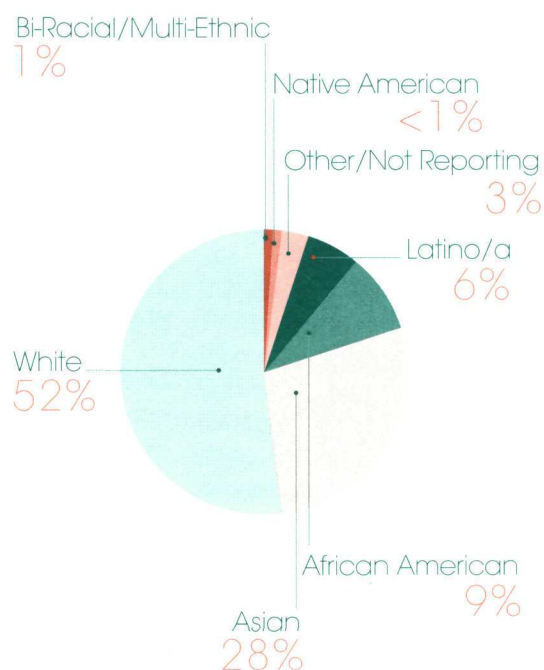


STUDENT PROFILE

Testing Highlights

- Mean SAT I composite score for IMSA seniors was 1413, 396 points above the national average for college-bound seniors.
- Mean ACT composite score for IMSA seniors was 31.1, 10.1 points above the national average for college-bound seniors.
- Of IMSA juniors and seniors taking the Advanced Placement Examinations, 86% scored "3" or better and 64% scored "4" or better.
- Mean SAT II score for IMSA seniors taking the Mathematics-Level IIC Test was 749, 100 points higher than the national average for college-bound seniors. Mean IMSA score for the English Writing SAT II Test was 665, 96 points higher than the national average for college-bound seniors.
- For more detailed information regarding student testing, you can request a copy of the IMSA Profile by contacting the College and Academic Counseling Office at (630) 907-5056.

Ethnicity



To lead the transformation of teaching and learning in mathematics and science in Illinois and beyond.

To build the capacity of Illinois educators (including IMSA educators) to transform mathematics and science teaching and learning in their settings.

Second Decade PROGRAM



Mathematics teachers Rick Knuffman of Woodland H.S. in Streator and Robert Wegner of Highland Park H.S. attend a Mathematical Investigation summer workshop at IMSA.

In 1997-98, IMSA served 168 institutions, 404 educators and 130 students in school-based partnerships; 1,043 institutions and 1,920 educators in various professional networks (such as the Illinois Problem-Based Learning Network); 149 institutions and 218 educators in conferences and institutes, distributed 13 different products to 14,669 educators and had more than 260,000 visits to various service program websites.

During 1997-98, school-based partnerships increased markedly both in number of programs and numbers of educators reached. Over the last three years, the number of partnerships has increased from eight to 16, and the number of educators served has increased from 216 to 404. In addition, almost 120,000 students were indirectly impacted through IMSA's professional development partnerships, networks, and institutes and conferences.

Another significant highlight in 1997-98 was the publication of the PBL book, *Problems as Possibilities - Problem-Based Learning for K-12 Education*. The book was authored by Linda Torp, IMSA's Director of Academic Planning and Research, and Sara Sage, former IMSA researcher and current University of Indiana-South Bend professor. The book was distributed through the Association for Supervision and Curriculum Development (ASCD) to its 12,000 premium-level members, as well as to a variety of other educators. ASCD is the world's largest educational organization.





CHALLENGE 2&3

IMSA programs & services for educators and students fall into three broad categories:

Professional Development

Illinois teachers learn to design and implement integrative, standards-based learning experiences for their students. Examples of programs include Problem-Based Learning Institutes, Standards-based Curriculum Alignment Workshops, IMPACT II Teacher Network, Illinois Scientific Literacy Network, Illinois Problem-Based Learning Network, Summer 'AD' Ventures, and Smithsonian Integrated Science Partnerships.

Product Development

Products for Illinois teachers include learning materials, tools and experiences. Examples include interactive multimedia projects, curriculum materials, PBL book, video and website, Internet Toolkit and IMSA Math Journal

Public Policy Leadership

IMSA works closely with policymakers to shape Illinois' agenda for mathematics and science learning and teaching and to strengthen programmatic coherence, integration and leverage statewide. Examples include IMSA's role in the Illinois Science and Technology Advisory Council, and Illinois Learning Standards Project, and initiatives and recommendations for teaching standards, teacher preparation, certification and professional development, and the role and use of technology to support teaching and learning needs.

IMSA also sponsors programs for other Illinois students to encourage their interests in mathematics and science. Examples include Science Explorers and Summer Sleuths.

(Challenge 2 & 3 continued on pg. 10)



Illinois Service INITIATIVES

1997 - 98 Summary

Partnerships

Educators	404
Institutions	168
Students	130
<i>East St. Louis Mathematics Partnership Program</i>	
<i>Lisle Research Partnership</i>	
<i>Smithsonian Partnership</i>	
<i>Summer AD'Ventures II Program</i>	
<i>Plainfield Curriculum Alignment Partnerships</i>	
<i>Moonlink/NBPTS ISU Partnership</i>	
<i>PBL - Hinsdale Advanced Partnership Project</i>	
<i>PBL - JUCPD Partnership Project</i>	
<i>PBL - Barry Elementary Partnership Project</i>	
<i>PBL - First in the World Consortium Partnership Project</i>	
<i>PBL - Mid-Illini Partnership Project</i>	
<i>PBL - CPBL Design Studio Contracts</i>	
<i>IPBLN Partnership/Summer Sleuths</i>	
<i>PBL - Research Partnerships</i>	
<i>IPBLN - Action Research Partnerships</i>	
<i>Shepard Research Partnership</i>	

Networks

Educators	1920
Institutions	1043
<i>Illinois Scientific Literacy Network</i>	
<i>First in the World Consortium</i>	
<i>IMPACT II Teacher to Teacher Network</i>	
<i>Illinois Problem-Based Learning Network</i>	
<i>ASCD's PBL Net</i>	
<i>PBL - IMSACPBL-L (Internet Listserve)</i>	

Institutes & Conferences

Educators	218
Institutions	149
<i>Illinois Scientific Literacy Network Conference</i>	
<i>NASTS Conference</i>	
<i>PBL - Harris Institute</i>	

Other Service Programs

Students	85
<i>Science Explorers Summer Program</i>	
<i>Summer Enrichment for Academics in Math and Science</i>	

Service Program Websites

Home Page	26,040
Within Site	237,646

estimated; cannot be determined from Listserve, hits include IMSA classroom usage not available, Illinois State University-based

<i>Illinois Scientific Literacy Network Website</i>
<i>Integrated Science Website</i>
<i>Math Journal</i>
<i>Summer AD'Ventures I Website</i>
<i>Summer AD'Ventures II Website</i>
<i>IMSA Scientific Visualization Website</i>
<i>IMPACT II Teacher to Teacher Network Website</i>
<i>CPBL Website</i>
<i>IPBLN</i>
<i>PBL-Net Website</i>
<i>I-Teams/I-teams II Website</i>

Service Program Products

Products	13
Distributed	14,669
<i>Internet Toolkit</i>	
<i>Real Science</i>	
<i>Newsletters</i>	
<i>Selected IMSA Articles Used as Service Resources</i>	
<i>PBL - ASCD Book "Problems as Possibilities"</i>	
<i>PBL/ IPBLN Resource Manuals</i>	
<i>PBL Videos</i>	

Private Sector Investment

The IMSA Fund for Advancement of Education works to secure the support and participation of various constituencies including individuals, corporations, foundations, educational institutions and governmental agencies to advance the Academy's mission. During 1997-98, the IMSA Fund raised a record \$2.3 million in external support, which included two leadership gifts totaling more than \$1 million.

The IMSA Fund has raised a total of \$11.6 million since 1987.

To receive a copy of the 1997-98 IMSA Fund Annual Report, contact the Office of Institutional Advancement and Public Policy at (630) 907-5040.

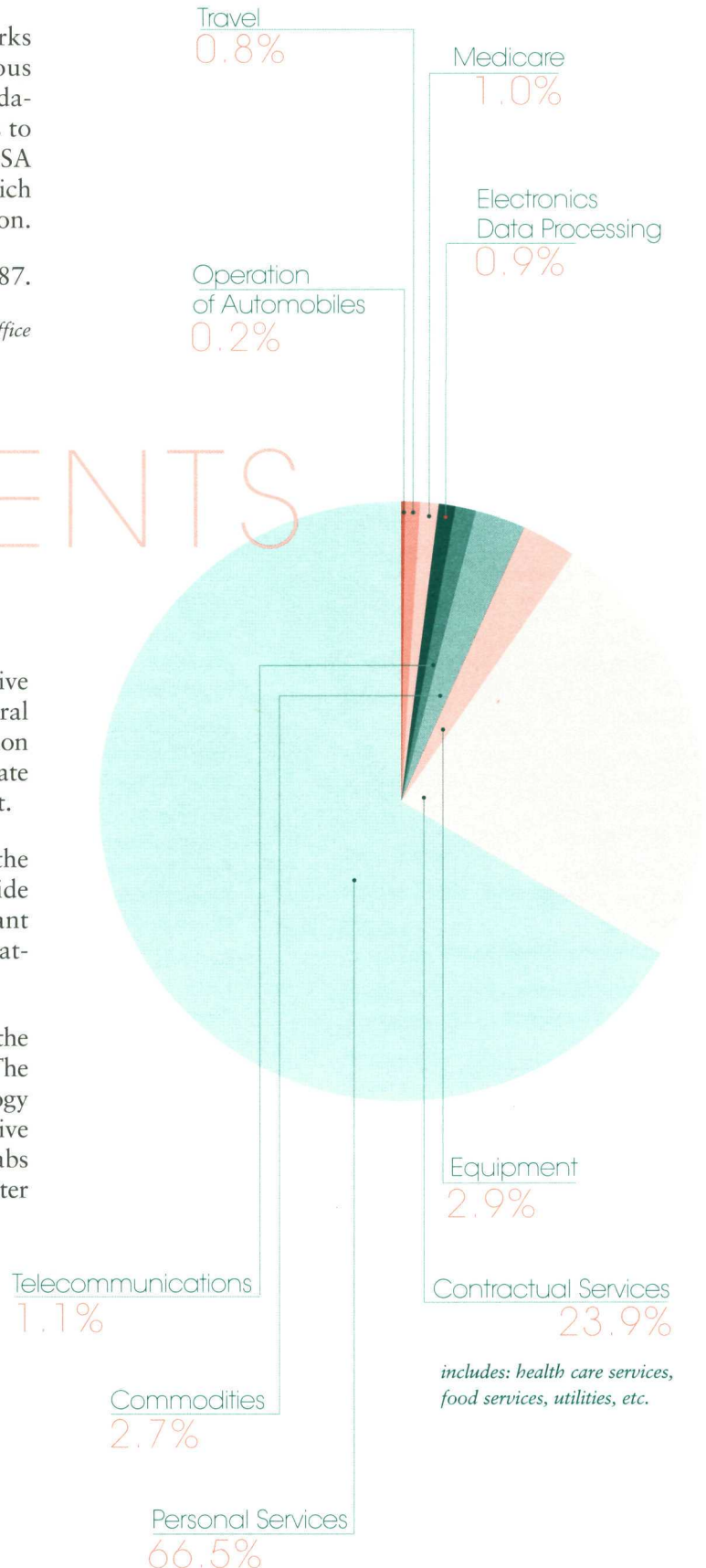
INVESTMENTS

Illinois' Investment

To support and expand the Academy's research, innovative teaching and service programs/initiatives, the Illinois General Assembly appropriated an operating budget of \$13.15 million in 1997-98. Expenditures, allocated according to the state comptroller's guidelines are highlighted in the chart at right.

In addition, the Academy was awarded a contract from the Illinois State Board of Education to support a statewide service program, the Illinois Scientific Literacy Grant Program, to transform teaching and learning in mathematics, science and technology.

IMSA parents paid a \$920 fee in 1997-98 to offset some of the costs of cocurricular programs and residential services. The most significant capital projects included ongoing technology improvements, renovation of the pool and other supportive structures as well as capital planning and design of the Tellabs Studio for Professional Development and the Grainger Center for Imagination and Inquiry.



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